

DBTaint: Cross-Application Information Flow Tracking via Databases

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Motivation

As we become more reliant on Web services, these services become more attractive targets to attackers. Tracking the flow of “tainted” (untrusted) data through a system is a proven method of detecting vulnerabilities and preventing many types of attacks. Unfortunately, most existing information flow tracking systems are a poor fit for the multi-application architecture of modern Web services.

The Problem

Many existing information flow system can only track tainted data through a single application. However, most Web services include at least one Web application and one database application. Single-application systems lose taint information at the application boundaries, leaving users with imperfect options including:

- Consider all data from databases tainted
- Consider all data from databases untainted
- Manual annotation
- Application-specific decisions or specialized environments

Many system-wide information flow tracking systems are too coarsely grained (operating at the process or file level), while fine-grained systems that operate at the instruction level lack the ability to make use of high-level database semantics.

DBTaint provides

- End-to-end information flow tracking through Web services, across Web applications and databases
- Mechanisms for leveraging single-application information flow systems in multi-application Web services
- Information flow tracking in existing Web services, requiring no changes to Web applications
- Taint propagation through database functions

Use Cases

- Persistent cross-application information flow tracking
- Regression testing, bug detection
- Identification of incomplete sanitization policies via column analysis

Implementation

Supports:

- Perl applications
- Perl DataBase Interface (DBI) API
- Java applications
- Java Database Connectivity (JDBC) API
- PostgreSQL Database

Evaluation

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| RequestTracker (ticket tracking system) | JForum (discussion board system) |
| •60,000+ lines of Perl | •30,000+ lines of Java |
| •Perl DBI (DataBase Interface) API | •Java Database Connectivity (JDBC) API |
| •Perl taint mode | •Character-level taint engine [Chin '09] |

